Journal of the Society of Arts.

FRIDAY, AUGUST 28, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE III., DELIVERED MONDAY, FEBRUARY 3.

Construction of Dietaries: Preparation and Culinary Treatment of Foods.

The construction of dietaries involves a variety of considerations, as—1st. The determination of the real wants of the body under different circumstances of age, sex, constitution, labour and climate; 2nd. A proper selection of food, as regards quality, nutritive power, appetizing property, digestibility, and price; 3rd. The association of foods in such wise as not to offend the appetite or burden the digestive powers; 4th. A right treatment of them by cooking, &c., so as to render them most useful to the system; and 5th. A just distribution of the daily diet in appropriate meals.

As regards the first question—namely, *the determination of the actual dietetical wants of the body*—it may be answered from two sets of facts, as those which pertain to the minimum quantities of food capable of being used without loss of health or bodily vigour, and those which relate to the amounts of carbon and nitrogen exhaled from the body during different conditions of life.

In a general way it may be said that a healthy vigorous man consumes from 700 to 800 lbs. of solid food (dry) in a year. This amounts to about 2 lbs. of dry, solid matter daily; and the quantity of water (free and combined) is about 5½ lbs. daily.

Pursuing the inquiry a little farther, we find that a man cannot live on a punishment prison diet of 1 lb. of bread a-day with water, for in three days he will lose about 3 lbs. in weight, and will show signs of commencing starvation. This diet contains 1·3 oz. of nitrogenous matter and 8·42 of carbonaceous (=1,995 grains of carbon and 90 of nitrogen). Even the poor needle-women of London can only just exist, in a state of feeble vitality, with an average diet of 1½ lbs. of bread a-day, with about 1 oz. of dripping. This contains nearly 2 oz. of nitrogenous matter, and 14·65 of carbonaceous, calculated as starch (=3,271 grains of carbon and 135 of nitrogen). And in military prisons, where as much as 3·8 oz. of nitrogenous food, and 22·2 oz. of carbonaceous (=6,925 grains of carbon and 256 of nitrogen), are supplied daily to prisoners for short terms of confinement, they frequently lose weight and give evidence of decay; so that for longer periods of imprisonment it is found necessary to increase the diet to 4·7 oz. of plastic matter, and 27·8 of respiratory (=8,647 grains of carbon, and 317 of nitrogen); in fact, according to Dr. Christison, the men confined in the prison at Perth cannot even do the work of pumping the water for the prison on a daily diet of 6 oz. of plastic matter, and 25 of respiratory (=7,239 grains of carbon and 405 of nitrogen).

Again, Dr. Edward Smith found in his inquiries into the dietaries of adult male operatives of Lancashire and Cheshire, during the cotton famine, and also into those of the low-fed operatives of England, that the daily amount of food, only barely sufficient for existence, must contain 2·84 oz. of nitrogenous matter, and 19·25 of carbonaceous (=4,300 grains of carbon and 200 of nitrogen). These are contained in 2 lbs. 3 oz. of bread, which is regarded as a famine diet. The farm labourers of England consume daily an average of 3·18 oz. of plastic matter and 26·01 of respiratory. In Scotland, Wales, and Ireland, the amounts are somewhat larger, as will be apparent from this diagram:—

AVERAGE DAILY DIET OF FARM-LABOURERS IN THE UNITED KINGDOM.

	Dry nitrogenous matter.	Dry carbonaceous matter.	Carbon.	Nitrogen.
	oz.	oz.	grs.	grs.
In England..	3·18	26·01 =	5810	228
In Wales....	4·12	31·22 =	6901	290
In Scotland..	4·76	31·34 =	6297	335
In Ireland ..	4·94	28·73 =	6195	348
Average of all	4·25	29·07 =	6477	300

These are the results of inquiries into the dietaries of many hundreds of families, the results being computed as for adults; but it is very probable, as Dr. Smith remarks, that the nourishment obtained by the labourer himself is somewhat above the average. This, in fact, is confirmed by the more extensive investigations of Dr. Lyon Playfair, who concludes, from a large series of observations, that the following may be regarded as the average proportions of the several constituents of food in the daily dietary of an adult man under different circumstances of existence:—

Daily Diets for	Flesh-former.	Fat.	Starch and Sugar.	Nitrogenous.	Carbonaceous calculated as starch.
	oz.	oz.	oz.	oz.	oz.
Subsistence only	2·0	0·5	12·0 =	2·0 +	13·2
Quietude	2·5	1·0	42·0 =	2·5 +	14·4
Moderate exercise	4·2	1·8	18·7 =	4·2 +	22·0
Active labour ..	5·5	2·5	20·0 =	5·5 +	26·0
Hard work	6·5	2·5	20·0 =	6·5 +	26·0

These conclusions accord pretty well with the determinations of Pettenkofer and Voit, who say that an

adult requires daily, when at work, 5·22oz. of nitrogenous matter and 22·38 of carbonaceous (calculated as starch). Taking, therefore, the mean of all these researches, it may be said that a man requires daily the following amounts of carbonaceous and nitrogenous matter for idleness, for ordinary labour, and for active labour:—

Daily Diets for	Nitrogenous.	Carbonaceous.	Carbon.	Nitrogen.
	oz.	oz.	grs.	grs.
Idleness	2·67	16·83	3,856	187
Ordinary labour	4·56	24·48	5,757	319
Active labour ..	5·81	24·31	5,837	400

By pursuing the second method of inquiry, and estimating the wants of the body from the amounts of carbon and nitrogen exhaled and secreted, it is found that the proportion of carbon evolved as carbonic acid from the lungs of a man in health varies from 6oz. to 13½oz. daily, the difference being dependent on temperature, exercise, &c. Dr. Edward Smith says that it amounts to—

7·85oz. daily while the body is quiet;
9·11oz. do. with moderate exercise;
12·9oz. do. with considerable labour.

And he considers that a healthy man of average weight (150lbs.) emits 8·57 ounces of carbon from his lungs daily. This, added to the quantity discharged from the skin and bowels, is not less than 9·6oz. daily (= 4,200 grains) or just 28 grains per lb. of the man's weight. During light labour, he says it ranges from 9·6oz. to 10·5, and during hard work from 12·5 to 14oz.

The amount of nitrogen excreted as urea, &c., in the urine is also subject to great variation, according to the diet and exercise. Dr. Parkes found in his experiments on two soldiers, that with an ordinary diet and no exercise, it amounted to 2·03 grains per lb. weight of the body (= 304 grains per 150lbs.); and that with a non-nitrogenous diet, and no exercise, it was 0·95 grains per lb. weight (= 142 grains per 150lbs.); and with the same diet and active exercise it was 2·42 grains per lb. weight (= 364 grains per 150 lbs.).

Professors Fick and Wislicenus observed that the nitrogen secreted during an ordinary diet and no exercise, was at the rate of 1·53 grains per lb. weight (= 203 grains per 150lbs.); and that it fell to a little less than one grain per lb. weight with a non-nitrogenous diet during the labour of ascending the Faulhorn.

The researches of the Rev. Dr. Haughton, of Dublin, have led him to conclude that an average-size man, performing routine work, secretes 187 grains of nitrogen as urea daily (= 1·25 grains per lb. weight); and Dr. Edward Smith has estimated it at from 0·93 to 1·4 grains per lb. weight—a fair average being 1·15 (= 173 grains per 150lbs.).

The more extensive inquiries of Playfair, Ranke, Beigel, Moos, Vogel, and others, give a daily average of 171 grains of nitrogen as urea for a healthy man at rest, and 252 grains for ordinary labour.

It may therefore be safely concluded that with an ordinary diet, an average-size man excretes daily as urea 175 grains of nitrogen; and during labour of a moderate description it amounts to about 250 grains. Adding to these the proportions of nitrogen excreted in other forms in the urine, and the quantities passed from the bowels, the total amounts are probably about 190 grains while at rest, and 300 grains when at routine work; the difference, perhaps, being more dependent on the food than on the metamorphosed tissues of the body.

It thus appears that the proportions of carbon and nitrogen excreted correspond very closely with those contained in the diets which experience has proved to be necessary for man's sustenance; for when the results are put into a tabular form they stand thus:—

Daily Requirements of the Body.

	Nitrogenous Food.	Carbonaceous Food.	Carbon.	Nitrogen.
	oz.	oz.	grs.	grs.
During idleness as determined { By dietaries	2·67	16·83	= 3,856	187
{ By excretions	2·78	18·47	= 4,200	190
Average....	2·72	17·65	= 4,028	188
Routine work as determined { By dietaries	4·56	24·48	= 5,757	319
{ By excretions	4·39	19·80	= 4,815	300
Average....	4·48	22·14	= 5,285	310

The first of these averages is represented by 2lbs. 2ozs. of bread, and the second by about 3½lbs.

It appears also that the relation of the nitrogenous to the carbonaceous constituents of food should be about as 1 to 5½ or 6. These, in fact, are the proportions which Messrs. Lawes and Gilbert found to be best suited for fattening pigs. In milk, the proportions are as 1 to 3·6 (the butter being calculated as starch); and no doubt these are the right proportions for the dietaries of children. Again, it will be observed, that the relation of nitrogen to carbon is nearly as 1 to 19; whereas in milk it is about as 1 to 11. Referring to table No. 4 (p. 617) it will be noticed that the proportions in bread are as 1 to 22, and in meat as one to 13, showing that the former requires the addition of plastic matter, and the latter of respiratory.

In preparing dietaries, however, it will be best to take a rather liberal view of the question, and, therefore, I shall adopt the conclusions of Dr. Edward Smith—that even in periods of idleness a man's daily food should contain not less than 4,300 grains of carbon, with 200 of nitrogen; and a woman's at least 3,900 grains of carbon, with 180 of nitrogen—these being the proportions which, in his opinion, are necessary to avert starvation diseases; and they are represented in the case of a man's diet by 19·25 oz. of carbonaceous food, with 2·84 of nitrogenous. The diagram before you exhibits the amounts of different articles of diet capable of furnishing this quantity of nitrogenous matter, and it also shows the proportions of carbonaceous matter (calculated as starch) associated with it:—

Amounts of Food Yielding 200 Grains of Nitrogen or 2·84 oz. of Plastic Matter Necessary for a Man's Daily Diet.

Description of Food.		Carbonaceous matter in it.	Carbon in it.	
	oz.	oz.	grs.	
Skim-cheese	8·8	5·57	1,290	Carbon deficient
White fish	24·6	5·99	1,384	
Skim-milk	94·1	8·96	2,059	
Peas	12·6	9·33	2,141	
New milk	91·4	9·40	2,160	
Lean meat	18·3	11·36	2,629	
Oatmeal	22·9	17·54	4,000	
Wheat-flour	26·7	19·28	4,433	Carbon in excess
Baker's bread.....	35·6	19·28	4,433	
Indian meal	26·0	19·83	4,554	
Rye-meal	36·4	26·40	6,046	
Barley-meal	45·7	34·02	7,800	
Rice	45·7	34·02	7,800	
Bacon	32·6	38·04	8,714	

So that, whilst the first seven of these substances are deficient of carbonaceous matter (19·25 oz. being required), the last seven contain it in excess. It is, there-

fore, not difficult to construct a dietary from the several tables which I have placed before you; but perhaps it would interest you to know exactly what are the actual dietaries in use among different classes of persons; and first I will direct your attention to what Dr. Edward Smith found to be the average weekly dietaries of the low-fed operatives of England, Wales, Scotland, and Ireland.

Weekly Dietaries of Low-fed Operatives, calculated as Adults (Dr. E. Smith).

Class of Labourer.	Bread stuffs.	Potatoes.	Sugars	Fats.	Meat.	Milk.	Cheese.	Tea.	Containing		Cost.
									Carbon.	Nitrogen.	
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz	Oz.	Oz.	Grs.	Grs.	s. d.
Needle-women (London)....	124·0	40·0	7·3	4·5	16·3	7·0	0·5	1·3	22 900	950	2 7
Silk-weavers (Coventry)	166·5	33·7	8·5	3·6	5·3	11·6	1·0	0·3	27,028	1,104	1 11¾
Do. do. (London).....	158·4	43·8	8·8	5·5	11·9	4·3	0·3	0·6	48,288	1,165	2 8¾
Do. do. (Macclesfield)..	138·8	26·6	6·3	3·4	3·2	41·9	0·9	0·3	27,346	1,177	1 8½
Kid glovers (Yeovil).....	140·0	84·0	4·3	7·1	18·3	18·3	10·0	0·9	28,623	1,213	2 9½
Cotton-spinners (Lancashire)	161·8	22·6	14·0	3·1	5·0	11·8	0·7	0·7	29,214	1,295	2 3
Hose weavers (Derbyshire)..	190·4	64·0	11·0	3·9	11·9	25·0	2·2	0·4	33,537	1,316	2 6¼
Shoemakers (Coventry)	179·8	56·0	10·0	5·8	15·8	18·0	3·3	0·8	31,700	1,332	2 7¾
Farm labourer (England) ..	196·0	96·0	7·4	5·5	16·0	32·0	5·5	0·5	40,673	1,594	3 0
Do. do. (Wales)	224·0	138·7	7·5	5·9	10·0	85·0	9·8	0·5	48,354	2,031	3 5½
Do. do. (Scotland) ..	204·0	204·0	5·8	4·0	10·3	124·8	2·5	0·7	48,980	2,348	3 3¾
Do. do. (Ireland)	326·4	92·0	4·8	1·3	4·5	135·0	..	0·3	43,366	2,434	1 9¾
Mean of all.....	184·2	78·1	8·0	4·5	10·7	42·9	3·1	0·6	34,167	1,500	2 7¾
Average per day	26·3	11·1	1·4	0·6	1·5	6·1	0·4	0·1	4.881	214	0 4½

You will see from this table that the poor needlewomen of London are the worst fed of all the operatives in the three kingdoms, for they subsist on a weekly allowance of 102·52 oz. of carbonaceous food, with 13·49 oz. of nitrogenous (= 14·65 oz. carbonaceous, with 1·93 oz. nitrogenous daily), while the farm labourers of Ireland are, as regards the real nutritive value of their food, the best-fed of the lower operative classes. But it will also be noticed that the cost of the weekly dietary of the Irish labourer is only 1s. 9¾d. per week, while that of the needlewoman is 2s. 7d.—the latter feeding chiefly on bread, bacon, and tea, which are expensive foods, while the former consumes potatoes, milk, and Indian meal—foods which yield more nutriment for their money value than the more expensive foods of the English, Welsh, and Scotch labourers. And now we will contrast the dietaries of the poorer classes of operatives with those of better-fed persons, as soldiers, sailors, navigators, &c.; and for this purpose I shall avail myself of the accurate returns obtained and published by Dr. Lyon Playfair:—

Daily Dietaries of Well-fed Operatives (Playfair).

Class of Labourer.	Flesh-former.	Fats.	Starch and Sugar.	Containing		Containing	
				Carbonaceous.	Nitrogenous.	Carbon.	Nitrogen.
	Oz.	Oz.	Oz.	Oz	Oz.	Grs	Grs.
Fully-fed tailors....	4·61	1·37	18·47	21·64	4·61	5,136	325
Soldiers in peace ..	4·22	1·85	18·69	22 06	4 22	5,246	297
Royal Engineers (work)	5·03	2·91	22·22	29·38	5 08	6,494	358
Soldiers in war.....	5·41	2·41	17·92	23·48	5·41	5,561	381
English sailor	5·00	2·57	14·39	20·40	5·00	4,834	252
French do.	5·74	1·32	23·60	26·70	5 74	6,379	405
Hard-worked weavers	5·33	1·53	21·89	25·42	5·33	6,020	375
English navvy (Crimea)	5·73	3·27	13·21	21·06	5·73	5,014	404
English navvy (Railway).....	6·8	3·82	27·81	37·08	6·84	4,295	482
Blacksmiths	6 20	2·50	23·50	29 50	6·20	5,864	437
Prize-fighters (training)	9·80	3·10	3·27	10 70	9·80	4,366	690
Mean of all	5·81	2·42	18·63	24·31	5·81	5,837	400
Do. of low-fed operatives	3·04	0·64	21·18	22·78	3·04	4,881	214

In all these cases the carbonaceous matters of the food are estimated as starch; and I may state that the soldiers' dietary, when at peace, is calculated from the rations of the English, French, Prussian, and Austrian service; and when at war, it is derived from the actual dietaries of European and American soldiers during recent wars.

It would be interesting, if time permitted, to compare these dietaries with the dietaries of hospitals, prisons, workhouses, and lunatic asylums; for we should then perceive not merely how greatly they vary in their nutritive value, but also how little attention is paid to the principles which ought to guide our public authorities in the construction of public dietaries. In the prisons of England, Scotland, and Ireland, the several dietaries for short terms of imprisonment, as well as for longer periods, and for hard labour, vary respectively to so great an extent as to furnish an inducement for the commission of crime in certain districts rather than in others, because of the richness of the prison rations; and in all cases the dietaries of prisons are so greatly in excess of those of the union, that in times of distress they offer encouragement for misdemeanour, in order that the prison may be reached in preference to the workhouse; in short, while the day's rations of an unfortunate inmate of a union contains only about 17 oz. of dry nutritious matter, that of a destitute debtor contains 19·4 oz., and that of a convict 22 oz.; moreover, a prisoner confined for more than a month, without hard labour, in the jails of England, Scotland, and Ireland, would have 18·8 oz., 22·4, and 23·9 of dry nutriment respectively; the average rations for hard work containing about 21·7 oz., 31·5, and 25·6 in the prisons of the three countries.

Dr. Edward Smith has drawn attention to the serious want of uniformity in the dietaries of the unions of his district, and has urged the workhouse authorities to improve them. He also submitted to the Privy Council tables of dietaries, which are well suited to meet the requirements of the system at the lowest money cost. Here are a few of them, which may, perhaps, prove useful to those who are engaged in the benevolent work of supplying food to the poor in times of distress; and you will perceive that at various sums, from about 2s. to 3s. a-week per adult, very substantial rations may be provided. (See table, top of next page.)

The dietaries of women should be about 1-10th less than those of men in the case of indoor operatives, but

DIETARIES TO FURNISH AS NEARLY AS POSSIBLE 30,100 GRAINS OF CARBON AND 1,400 GRAINS OF NITROGEN PER MAN WEEKLY—WOMEN TAKE ONE-TENTH LESS.

COST.	1s. 11¾d.	2s. 0¼d.	2s. 3½d.	2s. 4¼d.	2s. 6d.	2s. 7½d.	2s 8¼d.	2s. 10½d	3s. 1¼d.	3s. 3½d.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Bread	144	128	160	160	128	160	160	160	192	160
Flour for dumplings	..	..	..	..	..	..	..	16	16	8
Oatmeal	16	32	16	32	32	16	16	16	..	8
Peas	..	..	..	..	12	6	..	..	..	..
Rice	..	..	16	..	..	..	16	..	8	8
Sugar	..	4	4	..	4	4	4	4	8	8
Treacle	..	16	8	8	8	..	8	12	8	8
Butter	..	..	..	..	2	..	..	2	..	12
Dripping	..	..	4	..	..	4	4	..	4	..
Suet	..	..	..	..	..	..	..	4	4	2
Meat without bone	8	8	..	8	8	8	16	12	8	24
Herrings	..	..	..	..	4	..	..	..	..	..
Bacon	..	..	..	8	4	8	..	..	8	..
Skimmed milk	70	140	60	70	120	120	70	120	70	100
Buttermilk	60	..	80	..	..	..	60	..	60	..
Tea	..	..	..	..	..	0·5	..	..	0·5	0·5
Coffee and chicory	..	2	2	..	1	1	2	2	1	1
	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
Nutritive values. Carbon	28,031	29,748	33,552	34,935	32,998	33,248	36,499	36,402	41,519	36,391
Nitrogen	1,409	1,291	1,511	1,548	1,859	1,609	1,674	1,638	1,768	1,620

they ought to be from 1-3rd to 1-4th less than the larger dietaries of men engaged in out-door labour.

As regards the dietaries of children, it may be stated generally that the chief part of their food should be milk. Up to the age of nine or ten months it should, if possible, be the milk of woman, which is richer in sugar than cow's milk, and much less rich in caseine; failing this, however, asses' milk is a good substitute, as it contains nearly the same amount of sugar and caseine as human milk. MM. O. Henri and Chevalier have given these as the proportions of the several constituents in 100 parts of the milk of different animals:—

	Asses' milk.	Woman's milk.	Cow's milk.	Goat's milk.	Ewe's milk.
Caseine	1·81	1·52	4·48	4·02	4·50
Butter	0·11	3·55	3·13	3·32	4·20
Sugar of milk	6·08	6·50	4·77	5·28	5·00
Various salts	0·34	0·45	0·60	0·58	0·68
Total solids	8·34	12·02	12·98	13·20	14·38
Water	91·66	87·98	87·02	86·80	85·62
Total	100·00	100·00	100·00	100·00	100·00

Cow's milk, therefore, diluted with about one-third its bulk of water, and sweetened with sugar, may be given to children; and up to nine or ten months no other food should be administered, for infants have not the power of digesting farinaceous or fibrinous substances. A child may take from two to three pints of milk thus diluted daily. After ten months, and to about twenty months, farinaceous matters may be mixed in gradually increasing quantities with the milk; and they should be well cooked by first baking them, and then thoroughly dissolving them by boiling. After this age, and up to the third year, the quantity of well-cooked farinaceous matters may be still further increased, and given as puddings with a little egg. Bread and butter may also be eaten, and towards the end of the time the child will digest well-boiled potato, with a little gravy of meat. From the third to the fifth year a little meat may also be given, and at the end of the ninth year it may partake of the usual food of the family; but all along it should make use of a large proportion of milk, in the various forms of bread and milk, or milk puddings, with eggs. About the tenth year a child will require about half as much food as a woman; and at the fourteenth year it will eat quite as much as a woman; in fact, the proportion of food required by the child is much greater per pound weight of the body than that of adults, because it has to form its tissues and build up its several structures. Dr. Edward Smith calculates that the proportions of carbon and nitrogen in the daily food at different ages should be about as follows:—

DAILY PROPORTIONS OF CARBON AND NITROGEN IN THE FOOD AT DIFFERENT AGES, PER POUND WEIGHT OF THE BODY.

	Carbon.	Nitrogen.
	grs.	grs.
In infancy	69	6·78
At ten years of age	48	2·81
At sixteen do. do.	30	2·16
At adult life	23	1·04
In middle age	25	1·13

So that for its weight the infant requires three times as much carbonaceous food and six times as much nitrogenous as an adult.

The construction of dietaries for particular purposes, as for training, for developing muscular tissue, for producing fat, or for reducing it, is beyond the scope of these lectures; but it may generally be said that, as in training the object is to form muscular tissue, to give it great endurance of action, and, at the same time, to reduce the weight of the body, it is accomplished by the use of nitrogenous food, with but little fat or farinaceous matter, and as little fluid as possible—so that muscular tissue may take the place of fat and water; and by constant exercise, the endurance and strength of the muscular tissue is increased, and the proportion of water in the tissues is reduced. King, in training, is said to have taken for his breakfast two lean mutton-chops, somewhat under-done, with dry toast or stale bread, and a single cup of tea without sugar; for dinner, 1 lb. or 1¼ lb. of beef or mutton, with toast or stale bread, and very little potato or other vegetable, and half-a-pint of old ale, or a glass or two of sherry; for tea a single cup of unsweetened tea with an egg and some dry toast; and

for supper half-a-pint of oatmeal-porridge or half-a-pint of old ale. The effect of this is to produce only a short-lived state of effectiveness, for, carried a little beyond the appointed time, it leads to disease; and even after the trial, there is often, as in the case of Heenan, terrible prostration of the system, and a necessity for returning immediately to an ordinary diet.

Foremost among the foods for developing fatty tissue are fats, as fat of meat, butter, cream, &c.; next to these are farinaceous matters, as arrowroot, starches, and the various meals; and after these are sugar, alcohol, &c.; so that in an attempt to reduce the bulk of the body, all of them, but especially the first, should be but sparingly used. Conversely, however, the use of fatty and farinaceous foods has a tendency to produce fat, and so also with fermented liquids, as beer and porter—the last having a high character for its capabilities of forming milk when drunk by nursing-women.

In associating different articles of diet, so as to secure the right proportions of the several constituents of food—**fat, sugar, or starch**, and nitrogenous matter, we find that we may not only rely on the sound indications of science, but may also trust, and trust safely, to the unerring guidance of our instincts—provided they have not been vitiated by fashion or perverted by evil habits. Science teaches us that the best proportions for the common wants of the animal system are about 9 of fat, 22 of flesh-forming substances, and 69 of starch and sugar; and experience also shows that these are the very proportions which we are constantly striving to maintain in our daily dietaries. Borrowing largely from the graphic illustrations of Liebig and Johnston, I may state that, whenever one kind of food is wanting in any particular constituent we invariably associate it with another that contains an excess of it. Certain meats, for example, which are deficient of fat are always eaten with substances that are rich in it—bacon is associated with veal, with liver, and with fowl, or we capon the latter, and thus increase its natural fat. We use melted butter with most kinds of fish, or we fry them in oil; while the herring, the salmon, and the eel, are usually fat enough in **themselves, and are** dressed and eaten alone. It is with a view to similar adjustment that we mix eggs and butter with sago, tapioca, and rice; that we add oil and the yoke of an egg to salad; that we boil rice with milk, and eat cheese with maccaroni. The same instinct has determined the use of vegetables with meat, and butter with bread. Bacon and greens, or beans and bacon, like pork and peas-pudding, is a conjunction of viands which does not owe its popularity to old habit or the mere taste of the epicure; and so with a dish, common in Ireland, under the name of Kol-cannon—the potato, which is poor in gluten, and the cabbage, which is usually rich in this ingredient, are mixed together, and thus they approach the composition of wheaten bread, but both of these substances are deficient in fat; add, therefore, a little bacon or fat pork to the mixture, and you have a Kol-cannon which has all the good qualities of the best Scotch oatmeal, and to many it is more savory and palatable. Again, the mixture so usual in Ireland and Alsace, of butter-milk or curdled milk and potatoes, and the combinations of rice and fat which make the diet of eastern nations; even the little dab of butter upon the poor man's potato, and the bit of cheese that he eats with his dinner, are matters not of luxury but of necessity, and they show how by long experience we have at last learnt to adjust the proximate constituents of food, so as best to maintain the health and vigour of the body.

And then, again, *the times for taking food* and *the proper distribution of it in appropriate meals*, are questions of considerable importance, notwithstanding that they have ever been influenced by the caprices of fashion and the artificial habits of society. How much they have had to do with the modification of the human species, and even with the extinction of whole races of men, is an etiological problem of much interest.

Man in his savage condition feeds with great irregularity, for when he finds that food is plentiful he eats from morning to night, and knows no other pleasure than that of eating and drinking and sleeping; but when it is more scarce he is content with a single meal a day. In both cases, however, the quantity of food consumed is excessive. We are told by travellers that the Hottentots, the Bushmen, and the inhabitants of South Africa, who feed in this manner are enormous gluttons. "Ten of them," says Barrow, "ate, in his presence, an ox, all but the hind legs, in three days; and the three Bosjesmen that accompanied his waggon, devoured a sheep on one occasion in less than twenty-four hours." Parry, Ross, and others, have also given the most astonishing accounts of the dietetical capabilities of the Esquimaux. Captain Parry once tried the capacity of a young lad scarcely full grown, and in twenty-fours he had eaten 4 lbs. 4oz. of the raw hard-frozen flesh of a sea-horse, the same quantity of it boiled, 1 lb. 12 oz. of bread and bread-dust, besides a pint and a quarter of rich gravy-soup, a tumbler of strong grog, three wine-glasses of raw spirits, and nine pints of water. According to Sir John Ross, the daily rations of an Esquimaux are 20 lbs. of flesh and blubber. But the most marvellous example of gluttony is given by Captain Cochrane, on the authority of the Russian Admiral Saritcheff, who was told that one of the Yakuti had consumed the hind quarter of a large ox in 24 hours, together with 20 lb. of fat, and a proportionable quantity of melted butter. To test the truth of this, he gave him a thick porridge of rice boiled down with 3 lbs. of butter, weighing together 28 lbs.:—although the glutton had already breakfasted, yet he sat down to the meal with great eagerness, and consumed the whole without stirring from the spot; and, except that his stomach betrayed more than ordinary fulness, he showed no sign of inconvenience. Captain Cochrane further adds that a good calf, weighing 200 lbs., will just serve for a meal for four or five Yakuti; and that he has himself seen three of them consume a reindeer at a meal. Liebig accounts for this by saying that a nation of hunters, especially when they go naked and are exposed to great losses of temperature, must consume large quantities of respiratory food; and if it so happens that the food is in its least effective form, as lean flesh, the quantity disposed of is enormous.

Among civilised nations, and until comparatively recent times, there were but two meals a-day—namely, dinner and supper. These were the meals of the Romans—the *prandium* or dinner being for the most part a light refreshment, eaten while standing, at about nine o'clock in the morning; and it generally consisted of the cold remains of yesterday's supper. It was commonly taken without wine, and, in fact, there was so little ceremony about it, that Plautus, in his comedies, has facetiously called it *caninum prandium*. The great meal of the day was the supper, or *cœna*, which was taken about three or four o'clock in the afternoon, and to which friends were invited. This was the ceremonious meal for which the wealthy and high families of Rome exhausted the resources of luxury and art. It always consisted of three parts—the *gustus* or antipast, which was intended as a mere smack or relish to whet the appetite. Then came the main part of the feast—consisting of many courses, with a chief dish or *caput cœnæ*, and when in thrifty families it was the only dish which went the round of the frugal board, it was aptly termed the *cœna ambulans*. After this there came the second course, or *mensa secunda*, composed of fruits and pastry, like a modern dessert.

The sums of money expended by the wealthy Romans on this meal were often ruinous. Vitellius is said to have spent as much as 400 *sestertia* (about £3,228 of our money) on his daily supper; and the celebrated feast to which he invited his brother Lucius cost no less than 5,000 *sestertia*, or £40,350 sterling. It consisted, according to Suetonius, of 2,000 different dishes of fish and 7,000 of fowls, with other equally numerous meats. His daily

food, says our classical writers, was of the most rare and exquisite nature, the deserts of Libya, the shores of Spain, the waters of the Carpathian Sea, and even the coasts and forests of Britain were diligently searched for dainties to supply his table; and had he reigned long he would, says Josephus, have exhausted the great opulence of the Roman Empire. Ælius Verus, another of those worthies, was hardly less profuse in the extravagance of his suppers; for it is said that a single entertainment, to which only about a dozen guests were invited, cost above six million sesterces (6,000 *sestertia*, or nearly £48,500); and we are told by historians that his whole life was wasted in eating and drinking—being spent in the voluptuous retreats of Daphne, or else at the luxurious banquets of Antioch. So profuse, indeed, was the extravagance of those times, that to entertain an emperor at a feast was to encounter almost certain financial ruin—one dish alone at the table of Heliogabalus has been known to cost about £4,000 of our money; no wonder, therefore, that these imperial feasts were lengthened out for hours together, and that every artifice, often revolting in the extreme, was used to prolong the pleasure of eating, or that Philoxenus should have wished that he had the throat of a crane with a delicate palate all the way down.

Hardly less extravagant were the dining propensities of our own forefathers, who in every way copied too closely the luxurious habits of their Roman conquerors. In fact, no circumstance, as Mr. Wright observes, is more remarkable in ancient history than the readiness with which the people who came under the sway and influence of Rome, abandoned their nationality, and followed the luxurious habits of their rulers. Even so late as the time of Holinshed, the famous chronicler of the 16th century, the manners of the English were the subject of severe comment; for he tells us that "in number of dishes and changes of meat, the nobility of England (whose cooks are, for the most part, musical-headed Frenchmen and foreigners), do most exceed; sith there is no day in manner that passeth over their heads, wherein they have not only beef, mutton, veal, lamb, kid, pork, cony, capon, pig, or so many of them as the season yieldeth, but also some portion of the red and fallow deer, beside great variety of fish and wild fowl, and thereto sundry other delicates, wherein the sweet hand of the seafaring Portingale is not wanting; so that for a man to dine with one of them, and to taste of every dish that standeth before him, is rather to yield unto a conspiracy with a great deal of meat for the speedy suppression of natural health, than the use of a necessary meal to satisfy himself with a competent repast to sustain his body withal." He adds, too, "that gentlemen and merchants keep much about the same rate; and when they make their ordinary or voluntary feasts, it is a world to see what great provision is made of all manner of delicate meats from every quarter of the country, wherein, beside that, they are often comparable herein to the nobility of the land; so that they will seldom regard anything that the butcher usually killeth, but reject the same as not worthy to come in place. In such cases, also, *geliffes* of all colours, mixed with a variety in the representation of sundry flowers, herbs, trees, forms of beasts, fish, fowls, and fruits; and thereunto *marchpane*, wrought with no small curiosity, tarts of divers hues and sundry denominations; conserves of old fruits, foreign and home-bred; suckets, codiniacs, marmalades, sugarbread, gingerbread, florentines, wild-fowl, venison of all sorts, and sundry outlandish confections, altogether seasoned with sugar, besides infinite devices, not possible for me to remember."

The learned Caius, also, in his "Counscill against the Sweat" of the same century (1552) comments in severe terms on the gluttony of his time, saying that the reason why the disease attacks the English more than others is, that they have "so moche sweating stuffe, so many euille humoures laid up in store, fro this displeasante, feareful, and pestilent disease, cause of their euille diet, whiche destroy more meates and drynckes withoute al ordre, conveniet time, reason, or necessite, the either Scotlande, or al other countries under the sunne."

Gradually, too, as the dinner got to be later in the day, and reached noontime, there was necessity for a light early meal, or *breakfaste*, as it was called; and as the dinner became later and later still, a fourth meal was added—the *lunch* or *luncheon*, which literally meant a slice of bread. In process of time, also, with the introduction of tea and coffee into England, there came a fifth meal; but all along the dinner was the great feast of the day; and the rule in using it was pretty much as Dr. Kitchener, in his time, advised—namely, to eat until there was a sense of satiety, the stimulus of every fresh dish being but as a whip to the appetite, so that the sense of satiety might come and go a dozen times. "It is produced in us," says Christopher North, "by three platefuls of hotch-potch, and to the eyes of an ordinary observer our dinner would seem to be at an end; but no; strictly speaking, it is just going to begin. About an hour ago did we, standing on the very beautiful bridge of Perth, see that identical salmon, with his back-fin just visible above the translucent tide, arrowing up the Tay, bold as a bridegroom, and nothing doubting that he should spend his honeymoon among the gravel-beds of Kinnaird or Moulenearn, or the rocky sofas of the Tummel, or the green marble couches of the Tilt. What has now become of the sense of satiety? John—the castors!—mustard—vinegar—cayenne—catsup—peas and potatoes, with a very little butter—the biscuit called "rusk"—and the memory of the hotch-potch is as that of Babylon the Great." Sense of satiety, indeed!—"We have seen it for a moment existing on the disappearance of the hotch-potch—dying on the appearance of the Tay salmon—once more noticeable as the last plate of the noble fish melted away—extinguished suddenly by the vision of the venison—again felt for an instant, and but for an instant, for a brace and a-half of as fine grouse as ever expanded their voluptuous bosoms to be devoured by hungry love."

We smile at the accounts given of the gormandizing powers of the natives of Arctic regions and the savages of Southern Africa, but our own habits in eating and drinking are scarcely less preposterous. Look at a modern dinner; beginning with soup, and perhaps a glass of cold punch; to be followed by a piece of turbot or a slice of salmon with lobster-sauce; and while the *caput cœnæ*, the venison or South Down, is getting ready, we toy with an oyster paté or a bit of sweat-bread, and mellow it with a bumper of Madeira. No sooner is the venison or mutton disposed of, with its never-failing accompaniments of jelly and vegetables, than we set the whole of it in a ferment with champagne, and drown it with hock or sauterne. These are quickly followed by the wing and breast of a partridge, or a bit of pheasant or wild duck; and when the stomach is all on fire with excitement, we cool it for an instant with a piece of iced pudding, and then immediately lash it into a fever with undiluted alcohol, in the form of cognac or a strong liqueur; after which there comes a spoonful or so of jelly as an emollient, a morsel of ripe stilton or paté de foie-gras as a digestant, a piquante salad to whet the appetite for wine, and a glass of old port to persuade the stomach, if it can, into quietness. All these are more leisurely succeeded by the *mensa secunda*, or dessert, with its ices, its preserves, its bakemeats, its fruits, its geliffes, codiniacs, and suckets, as Holinshed would call them, and its strong drinks; to be afterwards muddled with coffee, and complicated into a rare mixture with tea, floating with the richest of cream.

As a modest example of this sort of thing, and an indication moreover of the kind of novelties yet in store for us, let me read to you the *menu* of a late dinner at the Langham, where horse-flesh was the principal *viande*. It is very appropriately prefaced with a little bit of French philosophy—"*Les préjugés sont des maladies de l'esprit humain.*"

"*Potages*—Consommé de cheval. A la purée de destrier. *Amontillado.*

"*Poissons*—Saumon à la sauce Arabe. Filets de soles à l'huile hippophagique. *Vin du Rhin.*

"*Hors-d'œuvres*—Terrines de foie maigre chevalines. Saucissons de cheval aux pistaches syriaques. *Xérès.*

"*Relevés*—Filet de Pégase rôti aux pommes de terre à la crême. Dinde aux châtaignes. Aloyau de cheval farci à la centaure aux choux de Bruxelles. Culotte de cheval braisée aux chevaux-de-frise. *Champagne sec.*

"*Entrées*—Petits pâtés a la moëlle Bucéphale. Kromeskys à la Gladiateur. Poulets garnis à l'hippogriffe. Langues de cheval à la Troyenne. *Chateau Perayne.*

"SECOND SERVICE.

"*Rots*—Canards sauvages. Pluviers. *Volney.* Mayonnaises de homard a l'huile Rosinante. Petits pois à la Française. Choux-fleurs au parmesan.

"*Entrements*—Gelée de pieds de cheval au marasquin. Zephirs sauté à l'huile chevaleresque. Gateau vetérinaire a la Ducroix. Feuillantines aux pommes des Hesperides. *St. Peray.*

"*Glaces*—Crême aux truffes. Sorbets contre-préjugés. *Liqueurs.*

"*Dessert*—Vins de fins Bordeaux. Madère. Café.

"*Buffet*—Collared horse-head. Baron of horse. Boiled withers."

Even put into plain English all this would sound remarkable, and taken, as it is said to have been, without shying or gibbing, although, perhaps with a little bolting, it must have puzzled the stomach; and, like all our modern dinners, must also have severely taxed its powers, in selecting from the complicated mess, the right proportions of fat and flesh, and farinaceous matter required for the sustenance of the body.

Nor is it right to content ourselves, like savages, with a single meal a day, as was the custom of Dr. Fordyce, the celebrated professor of chemistry of the last century. Studying the habits of carnivorous animals, and reflecting on the principles of chemistry and physiology, he came to the conclusion that man required but one meal a day for all his physiological wants, and for more than twenty years his daily dinner was as follows:—Regularly at four o'clock of an afternoon he would present himself at "Dolly's chop-house," and take his seat at the table reserved for him. Immediately on his arrival the cook would place a pound and a-half of rump-steak upon the gridiron, and while it was cooking the doctor would amuse himself with some such trifle as half a broiled capon, or a plate of fish, and a glass or two of brandy—his regular allowance being a quarter of a pint. Then came the steak with a full accompaniment of bread and potato, and it was always served with a quart tankard of strong ale. This was followed by a bottle of old port; and, when the dinner was finished, as it invariably was in an hour and a half, he walked leisurely to his rooms in Essex-street in the Strand, where he met his class and gave his lecture on chemistry.

But these are not habits of the great bulk of mankind, and although they may have been practised for a while with impunity, yet they serve not as illustrations of what ought to be done in the way of eating, but rather as examples of the wonderfully accommodating power of the stomach under the most disadvantageous circumstances; for experience teaches us that three meals a day, of the simplest quality, are best suited for our wants—breakfast to supply the want of long fasting, and to restore the waste of secretion during the night; dinner in the middle of the day, to support the system during the fatigue of ordinary labour; and a light meal at night, in the form of tea or an early supper, to carry on the functions of repair and secretion during the night. According to Dr. Edward Smith, the daily distribution of the food, supposing a physiological diet of 4,300 grains of carbon, with 200 grains of nitrogen to be taken, should be somewhat in this manner:—

	Carbon.	Nitrogen.
	grs.	grs.
For breakfast	1,500	70
For dinner	1,800	90
For supper	1,000	40
Total in the day	4,310	200

So that about one part should be eaten for supper, one and a-half for breakfast, and about two parts for dinner.

It is hardly necessary to say, that in constructing dietaries, *the foods should be associated in such a way as not to offend the appetite or burden the digestive powers;* and that they should also be varied from time to time, not merely in their kind, but also in their treatment, as in the manner of cooking and flavouring them; for the best descriptions of food will, if eaten in the same fashion day after day, occasion disgust, and be wasted. This is often the case in the badly-arranged dietaries of workhouses, and on ship-board. It was once so with the dietaries of the English army, when the same daily rations of boiled meat were provokingly served out to the men, while they listened to the tune of "Oh the roast-beef of old England." All this is easily provided for, and it is true economy to do so, by varying the food, the mode of cooking it, the manner of flavouring it, and by serving it, in the case of dinner, with different kinds of vegetables. In constructing dietaries, therefore, the main considerations are the due supply of the right proportions of nitrogenous and carbonaceous matters; for when these are not adjusted in a proper manner, the health is endangered, and the constitution may be slowly undermined. To use the words of Liebig—"there is a law of nature which regulates these things, and it is the elevated mission of science to bring this law home to our minds; it is her duty to show why man and animals require such admixture in the constituents of their food for the support of the vital functions, and what the influences are which determine, in accordance with the natural law, changes in the admixture.

"The knowledge of the law elevates man in regard to an important function which he possesses in common with the lower animals, above the level of those beings which are destitute of reason, and supplies him, in the regulation of those bodily wants which are essential to his existence and prosperity, with a protection which the lower animals do not require, because in them the commands of the instinctive law are not opposed or overpowered by the allurements of sense, or by a perverted and resisting will."

The recognition of this law, and the practical application of it to the dietaries of a community, are obviously of great advantage, for not only would they tend to increase the health and strength of the population, but they would also effect a great economy in the general use of food. That there are difficulties in the way of such an application cannot be doubted; in fact, the natural peculiarities of individuals, to say nothing of the differences of occupation, and the ever-varying quality of the food itself, are enough to create a doubt as to the possibility of its general application until the progress of science has gone far beyond its present position. Nevertheless, there are certain well-acknowledged facts at our disposal which may safely serve as a guide to practice.

The diseases which are incidental to an abuse of the law can hardly be discussed in this place, but it may be said, in general terms, that too much or too little of either of the main constituents of food will soon be followed by marked derangements of the animal body. An excess of respiratory food not only promotes the growth of fat, but actually interferes with the nourishment of muscular tissue. Those who feed largely on rice, on potatoes, or other farinaceous foods, or who indulge too freely in malt liquors, have commonly a bloated appearance, and have no faculty for sustained exertion. The brewer's

drayman, for example, is a bad subject for the ward of a hospital; and although he sometimes looks strong and muscular, yet in reality his vital power is feeble, and his tissues are fatty rather than muscular. The same is often the case with animals in the Zoological Gardens, when too large a quantity of respiratory food has been eaten, and their flesh has undergone a kind of fatty degeneration.

On the other hand, when the plastic elements of the food are in excess, the system becomes excited, too much blood is formed, and diseases of a plethoric character are induced. According to Liebig and his followers, an excess of force is developed, which manifests itself in irritability of temper, and in a savage disposition. How far this may be concerned in the frequently ungovernable conduct of our over-fed convicts may be deserving of consideration. A nation of animal *feeders*, says Liebig, is always a nation of hunters, for the use of a rich nitrogenous diet demands an expenditure of power, and a large amount of physical exertion, and this is seen in the restless disposition of all the carnivora of our menageries.

A deficiency of food, however, is quickly followed by a general breaking up of the animal frame. Plague, pestilence, and famine are always associated in the public mind; and the records of every country show how closely they are related. The medical history of Ireland is remarkable for illustrations of how much mischief may be occasioned by a general deficiency of food. Always the habitat of fever, it every now and then becomes the very hotbed of its development. Let there be but a small failure in the usual imperfect supply of food, and the lurking seeds of pestilence burst into frightful activity. The famine of the present century is but a too forcible illustration of this, for it produced epidemics which had not been witnessed in this generation, and it gave rise to scenes of devastation and misery which are not surpassed by the most appalling of the middle age. The principal form of the scourge was known as the contagious famine fever, and it spread, not merely from end to end of the country in which it had originated, but, breaking through all boundaries, it crossed the broad ocean, and made itself painfully manifest in localities where it was previously unknown. Thousands fell under the virulence of its action, for wheresoever it came it struck down a seventh of the people, and of those whom it attacked one out of nine perished. Even those who escaped the fatal influence of it were left the miserable victims of scurvy and low fever. Another example, not less striking, of the terrible consequences of what may be truly called famine, was the condition of our troops during the early part of their sojourn in the Crimea. With only just enough of food to maintain the integrity of the system at a time of repose, and at ordinary temperatures, they were called upon to make large muscular exertions, and to sustain the warmth of the system in the midst of severe cold. What could be expected but that the scourges which wait upon famine, as fever, diarrhœa, dysentery, and scurvy, should make their appearance in great force, and that the soldiers should perish by thousands. With an average strength of 24,000 men, the deaths from sickness alone, in the course of seven months, were at the rate of thirty-nine per cent., and in some cases it amounted to seventy-three. "Never before," says Colonel Tulloch, "is there record of a British army having sustained so frightful a loss in so short a time." During the Peninsula War, though the troops occasionally suffered much from sickness, the loss from that cause did not average above twelve per cent. for a whole year. Even in the ill-fated expedition to Walcheren, which threw the nation into mourning, the deaths amounted to only about 10½ per cent. for the half-year; and here, in this great city, with all the aggravating circumstances of want, vice, infancy, old age, and disease, it did not reach two per cent. during the time that our strong men were dying by thousands. "Armies have perished by the sword, and have been overwhelmed by the elements, but never, perhaps," says Colonel Tulloch, "since the hand of the Lord smote the host of the Assyrians, and they perished in a night, has such a loss from disease been recorded as on this occasion." May the lesson of so great a calamity be wisely applied in the future.

The connection of scurvy with improper or insufficient food is a matter of medical history, and its prevention by the use of fresh vegetables, especially potatoes, is so well known that it has often been the subject of legislation. Rarely appearing in the cabin, where the dietary is good, it is a frequent visitor to the forecastle; so that half the men of our sea-going vessels are found to be suffering from the disease when they return to port. As many, indeed, as 70 per cent. of a ship's crew are not unfrequently disabled by it; and there is no saying how many of the disasters at sea are caused by the inability of the men to work the vessel in times of severe weather. The legal supplementary allowance in emigrant vessels of 8 oz. of preserved potato, 3 oz. of other preserved vegetables (carrots, turnips, onions, celery, and mint), besides pickles, and 3 oz. of lemon juice for each person weekly, is found to be a perfect prophylactic of the disease, so that the one essential cause of it is evidently a privation of vegetable food.

And not less important are the morbific results of too much or too little saline matter in the food. I have already spoken of the salutary effect of certain calcareous salts in the water we drink; but according to Dr. Grange, the presence of magnesian salts in the water of a district may have something to do with the development of those remarkable forms of disease which are known as goitre and cretinism. In France, Germany, England, Sardinia, among all classes of people, of all habits, and in every variety of climate, those diseases are endemic where the soil is composed of magnesian rock, and the water charged with magnesian salts. How far the connexion extends is a chemico-physiological problem that has yet to be determined.

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

NORWICH, 1868.

The following is a list of the Papers read in the different Sections:—

THURSDAY, AUGUST 20TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Introductory address by Professor Tyndall.

W. R. Birt—Report on the Lunar Committee, with Introductory Remarks by the Chairman of the Committee.

Baron Von Mädler—On Changes of the Moon's Surface.

W. R. Birt—On the extent of the Evidence of Change on the Moon's Surface.

Father Secchi—Researches on Spectrum Analysis of the Stars.

W. Huggins—On some further results of the Spectrum Analysis applied to the Heavenly Bodies.

W. F. Barrett—On the Passage of Radiant Heat through Liquids.

W. F. Barrett—On a Simple Method of Exhibiting the Combination of Rectangular Vibrations.

SECTION B.—CHEMICAL SCIENCE.

W. H. Perkin, F.R.S.—On the Chloride of Methylene formed by the action of Nascent Hydrogen on Chloroform.

Dr. T. L. Phipson—On Sulphocyanide of Ammonium.

Dr. J. H. Gladstone—Refraction Equivalents and Chemical Theories.

C. Tomlinson, F.R.S.—On the Action of Nuclei in Inducing Crystallization.

F. A. Abel, F.R.S.—On the Chemical Composition of the great Cannon of Mohammed II., recently presented by the Sultan Aziz Khan to the British Government.

John Spiller, F.C.S.—Analysis of the ancient Roman Mortar of the Castrum of Burgh, Suffolk.

SECTION C.—GEOLOGY.

The President's Address.

Rev. O. Fisher—On the Denudations of Norfolk.

S. V. Wood and F. W. Harmer—On the Glacial Structure of Norfolk and Suffolk.

J. E. Taylor—The Norwich Crags, and their Relation to the Mammaliferous Bed.

A. Bell—On the Molluscan Fauna of the Red Crag.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

Inaugural Address by the President.

J. Gwyn Jeffreys, F.R.S.—Last Report on Dredging amongst the Shetland Isles.

Rev. A. M. Norman—On Shetland Sponges, and on a Remarkable New Genus of Sponge.

Dr. McIntosh—Report on Mr. Gwyn Jeffrey's Zetlandic Annelids of 1867.

Rev. A. M. Norman—On "Hyalonema Boreale, Loven," and Allied Forms.

Rev. A. M. Norman—On the Genera Palythoæ and Zoanthus coating Sponges.

Professor Balfour—Remarks on the Properties of Atropa Rhomboidea (Hooker) in Connection with its Botanical Character.

Professor Balfour—Notices of the occurrence of Hieracium collinum (Fries) in Selkirkshire, with remarks on some recent additions to the Scottish Flora.

A. G. More, F.L.S.—On the rediscovery of Scirpus parvulus.

SECTION D.—BIOLOGY (DEPARTMENT OF PHYSIOLOGY).

W. H. Flower, F.R.S., Vice-President, presided.

Professor Bennett—Report on the Action of Mercury on the Secretion of Bile.

Dr. B. W. Richardson, F.R.S.—Report on the Physiological Action of the Methyl Series.

E. Ray Lankester—Report on the Investigation of Animal Substances with the Spectroscope.

W. H. Flower. F.R.S.—On the Homologies and Notation of the Teeth of Mammalia.

Dr. Cobbold, F.R.S.—Flukes from the Indian Elephant, with remarks on their Affinities.

Dr. B. W. Richardson, F.R.S.—On some effects of extreme cold on nervous action.

Professor Rolleston, F.R.S.—On the Physiology of Pain.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

President's Opening Address.

C. R. Markham—Geography of the Abyssinian Expedition.

Rev. F. W. Holland—Topography of Sinai.

Dr. H. Blanc—Native Races of Abyssinia.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

The President's Address.

Frank P. Fellows, F.S.S.—On Mr. Seely's Proposed Form of Admiralty Estimates' Accounts as recommended by the Naval Committee of the House of Commons.

Henry Jeula, F.R.G.S., F.S.S., Hon. Sec. to Statistical Committee of Lloyds'—A Brief Statement of the Recent Progress and Present Aspect of Statistical Inquiry in Relation to Shipping Casualties.

Professor Leone Levi, F.S.A., F.S.S., &c.—On the Progress of Learned Societies, Illustrative of the Advancement of Science in the United Kingdom during the last Thirty years.

SECTION G.—MECHANICAL SCIENCE.

The President's Address.

Report of Committee on Steam-ship Performance.

Professor J. M. Macquorn Rankine, C.E., LL.D., F.R.S., &c.—On the Probable Connexion between the Resistance of Ships and their Mean Depth of Immersion.

Charles W. Merrifield, F.R.S., &c.—On the Necessity for further Experimental Knowledge Respecting the Propulsion of Ships.

Captain Douglas Galton, C.B., F.R.S., &c.—Description of a Ventilating Fire Place, with Experiments upon its Heating Power as compared with that of Ordinary Fire Places.

FRIDAY, AUGUST 21ST.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

W. Ladd—On a Further Development of the Dynamo-Magneto-Electric Machine.

Colonel Strange—On the Necessity for State Intervention to Secure the Progress of Physical Science.

Professor Everett—Report of the Committee on Underground Temperature.

T. Dobson—On a New Correction to be Applied to Observations made with Hadley's Sextant.

L. Bing.—On Actinometry.

Dr. J. H. Gladstone—On the Value of the Hollow Wedge in Examining Absorption Spectra.

Professor C. Zenger—On a New Automatic Telegraphic Apparatus.

SECTION B.—CHEMICAL SCIENCE.

Alfred R. Catton—Report of Synthetical Researches on Organic Acids.

A. Matthiessen—Report on the Chemical Nature of Cast Iron.

A. Matthiessen and W. J. Russell—Note on the Vesicular Structure of Copper.

E. Frankland—On the Combustion of Gases under pressure.

W. Perkin—On the Preparation of Anhydrous Salts of some Organic Compounds.

—Meusel—On Paraffin and its Products of Oxidation.

Alfred R. Catton—Notes on Löwig's Researches on the Action of Sodium Amalgam on Oxalic Ether.

C. W. Siemens—On Puddling Iron.

SECTION C.—GEOLOGY.

W. Pengelly—Fourth Report of Committee for the Exploration of Kent's Cavern, Devonshire.

W. Pengelly—On the Condition of some of the Bones in Kent's Cavern.

G. Maw—On the Sequence of the Deposits in Norfolk and Suffolk superior to the Red Crag.

W. S. Mitchell—Report of Committee on Leaf Beds of the Hampshire Basin.

E. Whymper—Report of the "Greenland Plant Beds Committee."

C. B. Rose—On the Conchoidal Fracture of Flint as seen on Flint-faced Buildings in Norwich, &c.

C. Moore—Report on the Fossil Contents of Mineral Veins in the Mendips, &c.

J. Bryce—Report of the Earthquake Committee for Scotland.

Rev. J. Gunn—On the Alternate Elevations and Subsidences of the Land and the Order of Succession of the Strata.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

W. Carruthers—Report on Fossil Flora.

H. Stevenson—On the Extinction of the Great Bustard in Norfolk and Suffolk.

Alfred Newton—The Zoological Aspect of our Game Laws.

A. D. Bartlett—On the Crested or Top Knotted Turkey.

Professor E. Faivre—Les Incisions Annulaires chez le Meurier (Morus).

Dr. W. Cleghorn—On the Distribution of the Principal Timber Trees of India, and the Progress of Forest Conservancy.

W. Brown—On the Claims of Arboriculture as a Science.

John Hogg—On the Wellingtonia Gigantea, with Remarks on its Form and Rate of Growth as compared with the Cedrus Libani.

Frank Buckland—Progress of Salmon Cultivation in England.

SECTION D.—BIOLOGY (DEPARTMENT OF ANATOMY AND PHYSIOLOGY).

W. H. Flower, F.R.S., Vice-President, Presided.

Dr. Bennett—Report on the Action of Mercury on the Secretion of Bile.

Dr. Anstie—On Certain Effects of Alcohol on the Pulse.

Professor Rolleston, F.R.S.—On the Pectorales Muscles.

Mr. Bridgman—Electrolysis in the Mouth.

Dr. Richardson, F.R.S.—On the Transmission of Light through Animal Bodies.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

W. Hepworth Dixon—The Great Prairies and the Prairie Indians.

Capt. Lindesay Brine, R.N.—Inhabitants of the Cyrenaica and Western Libya.

Thos. J. Hutchinson, H.M. Consul at Rosario—Rivers and Territories of the Rio de la Plata.

A. Waddington—Overland Route through British Territory, from the Atlantic to the Pacific.

R. Brown.—Physical Geography of the Queen Charlotte's Islands.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Report of the Metric Committee, and Recommendation Thereon.

Sir W. Jones, Bart.—On the Arterial Drainage of Norfolk.

W. D. Harding, C.E.—On the Fen Drainage of Norfolk.

Rev. Canon Girdlestone—The Condition of the Agricultural Labourer, Specially in the West of England.

SECTION G.—MECHANICAL SCIENCE.

Interim Report of the Committee on Agricultural Machinery.

R. B. Grantham, C.E.—On the "Broads" of East Norfolk, having reference to Water Supply, Storage, and Drainage.

Ferdinand Kohn—On the Recent Progress of Steel Manufacture.

Rev. Professor Willis, F.R.S.—The Arrangements Employed for the Distribution of Water to Towns and Dwellings in the Middle Ages.

C. J. Appleby—On Mechanism for Utilizing and Regulating Convict Labour.

SATURDAY, AUGUST 22ND.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

C. W. Siemens—On the Electric Conductivity of Platinum as affected by the Process of Manufacture.

Professor W. J. M. Rankine—Report of the Committee on Tidal Observations.

R. B. Hayward—On the Chances of Success or Failure of Candidates for Three-cornered and Four-cornered Constituencies.

Professor H. J. S. Smith—On Geometrical Constructions involving Imaginary Data.

Professor H. J. S. Smith—On a Construction for the Ninth Cubic Point.

Professor H. J. S. Smith—On a Property of the Hessian of a Cubic Surface.

Arthur Gearing—Examples of Ocular Demonstration of Geometrical Propositions.

W. H. L. Russell—Division of Elliptic Functions.

Prof. Everett—Resumé of Experiments on Rigidity.

Professor F. Guthrie—On the Thermal Resistance of Liquids.

A. R. Catton—Certain Facts bearing on the Theory of Double Refraction.

SECTION B.—CHEMICAL SCIENCE.

This Section did not meet on Saturday.

SECTION C.—GEOLOGY.

H. Woodward—Fourth Report on Fossil Crustacea.

H. M. Jenkins—On the Tertiary Deposits of Victoria.

Dr. J. Lowe—On the Carstone of West Norfolk.

Professor Otto Torrell—On some new Fossils from the Long Mynd Rocks of Sweden.

J. W. Salter—On a new Pterygotus from the Lowest Old Red Sandstone.

C. Jecks—On the Ferruginous Sandstone of the Neighbourhood of Northampton.

C. W. Peach—On the Fossil Fishes of the County of Cornwall.

S. Sharp—On a Remarkable Petrifaction in Northamptonshire.

C. B. Rose—On the Crag at Aldeby in Norfolk.

Dr. R. J. Mann—Notes on the Character of the Coal Field in Natal.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

This department did not meet on Saturday.

SECTION D.—BIOLOGY (DEPARTMENT OF PHYSIOLOGY).

This department did not meet on Saturday.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

This Section did not meet on Saturday.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Sir John Bowring, F.R.S.—On the Moral and Pecuniary results of Prison Labour.

F. S. Corrance, M.P.—On the Social Condition of the Labouring Classes.

SECTION G.—MECHANICAL SCIENCE.

Interim Report of the Committee on the Patent Laws.

J. Whitworth, LL.D., F.R.S.—On the Proper Forms of Projectiles for Penetration Through Water.

C. W. Siemens, F.R.S.—On Puddling Iron.

MONDAY, AUGUST 24TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Sir W. Thomson—Report of Committee on Electrical Standards.

G. J. Symons—Report of Rainfall Committee.

J. Glaisher—Report on Luminous Meteors.

G. Forbes—On the Meteor Shower of August, 1868.

Padre Secchi—On some Meteorological Results obtained in the Observatory at Rome.

Professor C. Meldrum—Synoptic Weather Charts of the Indian Ocean.

Professor C. Meldrum—Storm Warnings in Mauritius.

Dr. Mann—On the Resemblance and Contrasts of the Climates of Mauritius and Natal.

Dr. Mann—Abstract of Meteorological Observations made at Pietermaritzburg, Natal.

Professor Morren—Sur une Action Particulière de la Lumière sur les Sels d'Argent.

SECTION B.—CHEMICAL SCIENCE.

Otto Richter—On a System of Chemical Philosophy.

T. Wood—On Chemistry as a Branch of Education.

E. Meusel and C. H. Gill—On Parrafin and its Products of Oxydation.

E. Meusel—On the Physical Properties of Two Coloured Compounds.

A. R. Catton—Note on Löwig's Researches on the Action of Sodium Amalgam on Oxalic Ether.

Angus Smith—On the Absorption of Gases by Charcoal.

J. Dewar—On Coal Tar Bases.

SECTION C.—GEOLOGY.

Dr. P. M. Duncan—First Report on British Fossil Corals.

Dr. P. M. Duncan—On the Genus Clisiophyllum from the Scotch Coal Field.

W. R. Grove—"Artificial Rocking Stones."—An Experiment.

C. Moore—On New Discoveries connected with Quarternary Deposits.

Dr. E. Crisp—The Skeleton of a Fossil Whale, recently found on the Eastern Coast of Suffolk.

H. G. Seeley—On the Classification oi the Secondary Strata of England.

Professor H. Coquard—The Cretaceous Strata of England and the North of France, compared with those of the West, South-west, and South of France, and the North of Africa.

J. Evans—On some Cavities in the Gravel of the Valley of the Little Ouse.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

Professor Huxley—On some Organisms, which live at the bottom of the North Atlantic, in depths of 6,000 to 15,000 feet.

E. B. Tylor—Remarks on Language and Mythology as Departments of Biological Science.

Dr. McIntosh—On the Boring of certain Annelids.

Dr. McIntosh—On the Proboscis of Ommatophæa.

C. W. Peach—On a New Eschara, &c., from Cornwall.

Rev. M. J. Berkeley—To Exhibit Prepared Specimens of Agaricus.

M. Moggridge—On the "Muffa" of the Sulphur Springs of Valdieri.

B. T. Lowne—On Type Polymorphism and Variation in Relation to the Origin of Species.

Professor Dickson—On some of the Principal Modifications of the Receptacle and their Relation to the Insertion of the Leaf-Organs of the Flower.

SECTION D.—BIOLOGY (DEPARTMENT OF ANATOMY AND PHYSIOLOGY).

Professor Rolleston—On Sixteen Eskimo Crania.

Dr. Richardson, F.R.S.—Report on the Physiological Action of the Methyl Series.

Dr. Crum Brown—On the Connection between Chemical Constitution and Physiological Activity.

Dr. Hughlings Jackson—The Physiology of Language.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Edward Whymper—Explorations in Greenland.

Dr. T. Thomson—Report of the Committee on Overland Communication between India and China.

Professor E. Perceval Wright.—On the Seychelles Islands.

Sir Walter Elliot—Sepultural Remains in Southern India.

R. Brown—On the Formation of Fiords, Canons, Benches, and Intermittent Rivers.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Report of the Committee on Uniformity of Monies, Weights, and Measures.

Professor Leone Levi, F.S.A., F.S.S.—On the Present State of the Question of International Coinage.

G. Johnstone Stoney.—On the Natural System of Coinage.

C. S. Read, M.P.—On the Recent Improvements in Norfolk Farming.

W. Smith, M.R.C.V.S.—Statistics of the Progress and Extermination of the Cattle Plague in Norfolk.

J. G. Fitch, M.A., Assistant Commissioner to the School Inquiry Commission.—Educational Endowments.

SECTION G.—MECHANICAL SCIENCE.

J. Jones, F.G.S.—On Some Points Affecting the Economical Manufacture of Iron.

Interim Report of the Committee on the Safety of Merchant Ships and their Passengers.

W. Thorold, C.E.—Auxiliary Railway for Turnpike Roads, and Highways passing Through Towns.

H. Bright, C.E.—London Street Tramways.

W. J. Cooper.—An Improvement in Watering Roads.

Professor Archer.—On R. W. Thompson's Patent Road Steamer.

Lavington E. Fletcher.—The Unsatisfactory Character of Coroners' Inquests Consequent on Steam-Boiler Explosions.

A. Nobel.—On "Dynamite," a Recent Preparation of Nitro-glycerine, as an Explosive Agent.

TUESDAY, AUGUST 25TH, 1868.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

F. H. Varley—On the Construction of a Galvanometer for the Detection of Weak Electric Currents.

Hon. J. W. Strutt—On a Permanent Deflection of the Galvanometer-Needle by a Rapid Series of Equal and Opposite Induced Currents.

G. Gladstone—Observations on the Atmospheric Lines of the Solar Spectrum in High Latitudes.

Professor Sylvester—On the Successive Involutes to a Circle and some other Curves.

Rev. T. P. Kirkman—On the General Solution of Algebraical Equations.

Rev. R. Harley—Remarks on the Foregoing Paper.

W. Barrett Davis—A Historical Note on Lagrange's Theorem.

Professor Tait—On the Application of Quaternions to the Rotation of a Solid.

SECTION B.—CHEMICAL SCIENCE.

T. Fairley—Report on the Polyatomic Cyanides.

J. Dewar—On Kekule's Model to illustrate Graphic Formulæ.

W. Ditmar—On Vapour Tensions.

Ludwig Mond—On the Manufacture of Sulphur from Alkali Waste in Great Britain.

R. Gerstl—Different Spectra of one Chromium Salt.

J. A. Wanklyn—A Note on Sea Water.

J. A. Wanklyn—Researches on the Ethers.

F. Guthrie—On Amyl-ethyl-methyl-acetonamine.

A. R. Catton—On Mitscherlich's Law of Isomorphism and on the so-called Cases of Dimorphism.

SECTION C.—GEOLOGY.

H. Hicks—On Some Recent Discoveries of Fossils in the Cambrian Rocks.

Rev. J. Brodie—Geological Changes that have taken place on the Coast of Britain in recent times.

C. B. Rose—On the Thickness of the Chalk in Norfolk.

Rev. W. Fox—On Skull and Bones of Iguanodon.

H. G. Seeley—On the Relations Between Extinct and Living Reptiles, and on the Present State of our Knowledge of Pterodactyle.

J. Thompson—Notice of Certain Reptilian Remains Found in the Coal Measures of Lanarkshire.

Dr. Hyde Clarke—Note on the Western Asia-Minor Coal and Iron Basin, and on the Geology of the District.

Professor Tennant—On the Recent Discovery of Diamonds in the Cape Colony.

Rev. C. G. Nicolay—On the Diamonds of Brazil.

J. Curry—On the Formation of Certain Columnar Structures.

J. L. Lobley—On the Range and Distribution of the British Fossil Brachiopoda.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

Professor Archer—On the Occurrence of Erysimum Orientale in Peculiar Circumstances at Edinburgh.

Dr. Karl Koch—On the Specific Identity of the Almond and the Peach.

Dr. Karl Koch—On the Classification of the Species of Crocus.

Dr. Karl Koch—On the Necessity of Photographing Plants for a better Knowledge of them.

Herr Radlkofer—On Sapendaceæ.

G. Maw—On the Occurrence of *Lastrea Rigida* in North Wales.

Dr. Fraser—On a New British Moss found last summer on Ben Lawers.

Professor Hennessy—On the Possible Introduction of South European Plants in the West of Ireland.

J. Hogg—Notes on Two British Wasps and their Nests, illustrated by Photographs.

T. E. Gunn—Notice of Rare Fishes Occurring in Norfolk and Lothingland.

R. Garner—Notice of a Male Octopodous Cuttle-fish.

Dr. Otto Torrell—On the Tusks of the Walrus.

Professor Allman—On the Structure of *Coppinia Arcta*.

Dr. Grierson—On the Study of Natural History in Schools.

Rev. F. O. Morris—On the Difficulties of Darwinism.

DEPARTMENT OF PHYSIOLOGY.

Professor Paul Broca—On the Seat of the Faculty of Articulate Language.

Mr. R. Dunn—On the Power of Utterance in Respect of its Cerebral Bearings and Causes.

Dr. Crisp—On the Intestinal Canal and other Viscera of the Gorilla.

Dr. Crisp—On the Relative Weight and Form of the Eye and Colour of the Iris in Vertebrate Animals.

Dr. Crisp—On some Points relating to the Visceral Anatomy of the Thylacinus.

Professor Traquair—Additional Researches on the Asymmetry of the Pleuronectidae.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

W. Gifford Palgrave—The North-east Turkish Frontier and its Tribes.

Professor A. Vámbéry—On the Uigurs.

Dr. R. J. Mann—The Gold Fields of South Africa.

H. H. Howorth—Nomade Races of European Russia.

T. Baines—Victoria and Albert Rivers, North Australia.

J. Logan Lobley—Topography of Vesuvius, with an Account of the Recent Eruption.

Consul T. J. Hutchinson—On the Tehuelche Indians of Patagonia.

Granville Sharp—Description of Hong Kong.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Miss Becker—On some Supposed Difference in the Minds of Men and Women with Regard to Educational Necessities.

Joseph Payne—On the Relation between Learning and Teaching.

Horace Mann—Some Statistics Relating to the Civil Service.

James Heywood, M.A., F.R.S.—Sanitary State of the Indians in the New England Company's Settlement of Kanyageh, Canada.

Dr. Hyde Clarke, F.S.S.—On the Progress of Turkey.

F. G. P. Neison, Jun., A.I.A.—The Influence of Occupation on Health.

SECTION G.—MECHANICAL SCIENCE.

P. Le Neve Foster, Jun., C.E.—On the Irrigation of Upper Lombardy by New Canals to be derived from the Lakes of Lugano and Maggiore.

T. Login, F.R.S.E.—On the Abrading and Transporting Power of Water.

E. Charlesworth, F.G.S.—On the Substitution of Hand for Shoulder Guns; Illustrated by an Explanatory Exhibition of an Elevator Hand Gun made on the Breech-Loading Principle.

J. H. Gwynne—An Improved Centrifugal Pump.

C. Blyth—An Improved Machine for Drawing-off, Measuring, and Cutting Cloth and other Materials for Manufacturing Purposes.

Latimer Clark, C.E.—On the Advisability of Obtaining a Uniform Wire Gauge.

G. Fawcus—Improvements in the Packing of Boats.

G. Fawcus—Improvements in Lifeboats and Pontoons.

WEDNESDAY, AUGUST 26TH.

SECTION C.—GEOLOGY.

S. Jenkins—On the Noted Slate Veins of Festiniog.

Professor Göppert.—On the Inapplicability of Fossil Plants to Support the Theory of Gradual Transformation.

W. H. Baily—On the Fish Beds of Kiltorcan, in the County of Kilkenny.

E. R. Lankester—The Oldest Beds of the Crag.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

Professor Lawson—On the Flora of the Isle of Skye.

Professor Lawson—On the Geographical Distribution of *Buxbaumia Aphylla* in Great Britain.

Professor E. Perceval Wright, M.D.—Notes on the Flora and Fauna of the Seychelle Group of Islands.

C. Spence Bate and Professor Westwood—On the Geographical Distribution of the British Genera of the Sessile-eyed Crustacea.

SECTION D.—BIOLOGY (DEPARTMENT OF ANATOMY AND PHYSIOLOGY).

Dr. Thompson Dickson—On Vitality as a Mode of Motion.

Dr. Macalister—On the Comparative Anatomy and Homologies of the Atlas and Axis.

Professor Cleland—Is the Eustachian Tube Opened or Shut in Swallowing?

Professor Cleland—On the Relation of the Limbs to the Segments of the Body.

Mr. R. Garner—On the Anatomy of Carinaria Mediterranea.

Dr. Behier—On the Generation of White Blood Corpuscles.

Professor Heynsius—On the Albuminoid Substances of the Blood Corpuscles.

E. Ray Lankester and H. N. Mosely—The Nomenclature of Mammalian Teeth and the Teeth of the Mole.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Edward Crisp, M.D.—On the Statistics of Pulmonary Consumption in 623 Districts of England and Wales.

Henry Dircks, C.E., F.R.S.E., &c.—On Patent Monopoly, as Affecting the Encouragement, Improvement, and Progress of Science, Arts, and Manufactures.

G. Bell Galloway—Inventors and Inventions.

F. Wilson—Classification of Labour.

H. J. Ker Porter, M.R.S.A., &c.—On the Extension of the Contagious Diseases Act.

ADULT EDUCATION IN FRANCE.

The Minister of Public Instruction has published the "Statistics of Adult Classes for the year 1867-8," which show that much is being done in this important matter. During the past winter, 27,902 adult classes for men were opened in 26,193 communes, and 4,429 classes for women, in 4,084 communes, and the number of persons who attended them amounted to 779,373, of whom 95,281 were women. These figures are, however, inferior to those of the preceding year, for, says the document in question, if there has been no falling off in zeal, and if the teachers deserve the highest commendation, the winter was long and rigorous, the cold rendered communication difficult, especially in mountainous parts, while to other difficulties was added the dearness of provisions. In some rural communes a portion of the population was compelled to emigrate. Yet, in spite of these exceptional circumstances, a general desire to attend the adult classes was evident; married men and women, in many instances no longer young, were often to be seen at the evening-schools for months.

Of the whole number that attended the adult classes, at least one-half were in a state of complete ignorance, or had a most imperfect knowledge of the most elementary matters, and it appears that there were certainly not 18,000 who failed to derive any appreciable advantage from their attendance at the classes.

In Algeria, 82 classes were opened for men, and 22 for women, during the year; the whole of these were evening-classes, and open to all without any charge whatever. Of the teachers, 87 were laymen, and only 17 belonging to religious societies. The total number of persons who attended the schools was 2,548 men, and 274 women.

A comparison is made between the state of primary education at the present time and that of thirty-five years ago, when primary schools were organized in all the communes of France. In 1833 the proportion of illiterate conscripts was 48·83 per cent.; in 1853 it was 34·39 per cent., a gain of 14·44 per cent. in twenty years, or 0·72 per annum. The adult classes are gradually being completed by the addition of scholastic libraries, the teachers, as well as the poor scholars themselves, contributing the collections.

The movement is so unanimous, says the report in question, that it cannot be arrested, and it may safely be predicted that before long France will occupy a high place amongst the nations most famous for popular education.

THE DISEASE IN THE SUGAR-CANE IN MAURITIUS.

The following account of the disease which has made its appearance among the sugar-canes at Mauritius, is translated from the *Journal des Fabricants de Sucre*, and quoted in the *Produce Markets Review*:—"It appears, from a communication forwarded by M. E. Elias to the Imperial and Central Agricultural Society, that the sugar-cane disease burst out in Mauritius just about the time that the oïdium or vine disease made its appearance in Europe. By the colonists it was attributed to atmospherical influences; and it was remarked that at the very beginning it attacked almost exclusively the white Oataheite cane, the cane that has been longest under cultivation, and the one most esteemed by the planters on account of its rapid growth, its much greater saccharine richness, and the facility with which its leaves can be taken off in order to expose the plant to the action of the sun and other atmospheric influences. As soon as it was ascertained that the disease attacked this species of cane rather than others, it was resolved to abandon it, notwithstanding all its advantages. Sugar-plants were then procured from all quarters of the globe where the cane grew; but, unfortunately, the error was committed of obtaining plants from Ceylon, where the 'borer' existed, and so this destructive insect was introduced into Mauritius. This is the opinion of nearly all the planters, and it is so far corroborated by the circumstance that the borer first began its ravages on the estate of the very planter who received the plants from Ceylon; from there, the plague extended itself to the neighbouring estates. At Ceylon the ravages of the borer were so disastrous, that the planters were compelled to give up the cultivation of the sugar-cane altogether, and return to that of coffee, originally the chief staple of that island. From the very first, the borer has been the cause of much havoc, and even at the present moment it would do much more harm if the planters did not struggle against its attacks with the greatest energy. From the time of its introduction, the planters have been able to follow its course regularly from one district to another, striking first of all with extreme violence, and then diminishing in intensity, but never wholly disappearing from a place where it has once been established, so that it is necessary now to look upon it as always present, and never to give over watching it and combating it. It was in the year 1854 that its appearance first caused alarm. Its ravages may be compared to that of a fire. It was stated, in one of the reports of the Agricultural Chamber of Mauritius, that this insect was first introduced with the sugar-plants from Ceylon, about the year 1848.

"There are three ways of combating the borer; the first consists in plunging, for four-and-twenty hours, the heads of the canes which are to give the cuttings in water sufficiently warm to destroy the larvæ, without injuring the germinating powers of the plant. The second plan is to cut off the first shoots of the maiden canes; those are called maiden canes which spring directly from the cuttings, and which have not yet brought forth any yield. The planters wait until these new canes have grown for three months, after which they are cut down close to the ground. In this way, not only are the borers destroyed which are found in them, since the canes from this cutting are burnt, after being placed in heaps, but we are enabled to get canes with a much stronger skin, and much more fitted to resist the attacks of the insect. For the third method, there is the destruction of the caterpillars, which takes place in canes which have sprouted after the amputation described previously, as soon as they have attained a certain height. Native labourers traverse the sugar-fields, armed with knives, inspect the canes one after the other, and destroy the borer as soon as they come across it, in one of the holes that the insect makes in the cane. The Agricultural Chamber of Mauritius has offered a prize of 50,000 francs to any one who will discover a sure and practical method of getting rid of the borer. After being tormented by the borer for the last ten years, just as they were congratulating themselves on having almost put an end to the evil, the planters discovered the white louse *(pou blanc)*, at the same time that they became aware of a new disease in the cane, which, though not

quite so disastrous as the first, is still serious enough to cause some anxiety, and to reduce the estimates of the yield; this last disease is generally attributed to the impoverishment of the soil. The first disease affected the heart of the cane, which soon became rotten; the leaves lost their colour, vegetation was arrested, and the cane was completely dried up. The new disease only turns the leaves yellow, as if they had received a sunstroke, and, from that moment, the cane is done for. These effects are noticed more particularly in the centre of the squares, though sometimes the whole field is attacked. It was observed that this last disease was most prevalent in those districts where guano had been used in excess. Hitherto those quarters which are moist and cold have been most free from the white louse, and the last disease. The white louse does considerable damage to the canes on which it settles, and without entirely destroying them greatly impedes their vegetation. The white louse made its first appearance amongst us in 1858, or 1859, and settled on the rose-trees before it attacked the sugar-cane; it was supposed to have come from the Isle of Bourbon."

STATISTICS OF BIRTHS AND DEATHS IN FRANCE.

The tables of births and deaths for the year 1865 have recently been published; and from them M. L. de Lavergne, member of the institute, makes the following remarks upon their results. The returns in question show that the year 1865 was one of the worst of which the statistics have yet appeared; the causes which had arrested the progress of the population had apparently diminished since 1861, but they reappeared with renewed force in 1865.

The returns of births and deaths for that year give the following result:—

Births	1,006,753
Deaths	921,887
Excess of births	84,866

During a certain period preceding 1848, the average annual excess of births amounted to 180,000; since 1848 it has averaged 100,000; and 1865 falls sadly below that rate. M. de Lavergne states that the diminution does not arise so much from a falling off in the number of births, as in an increase in the deaths; these exceeded 900,000 in 1865, a number only reached in 1849, 1854, 1855, and 1859. The Mexican war was probably a principal cause of the large total in 1865.

In thirty-one departments, forming more than one-third of the whole of France, the deaths were actually in excess of the births; and in this list includes some of the richest portions of the country, such as the Bouches du Rhone, the two Charentes, Côte d'Or, Gironde, Manche, Marne, Seine-et-Marne, Seine-et-Oise, Var, Vaucluse, Yonne, Eure, and Calvados.

The departments in which the excess of deaths was greatest were Bouches du Rhone and Var, where the cholera raged during the year 1865. In the case of the former department, the deaths were in relation to the births as more than 18 to 15, and in the case of the Var 10½ to 7.

In the Nord, on the contrary, the most thickly populated of all the departments, the deaths were less than 33 to 46, leaving an excess of 13,293 births. After the Nord, the departments which gained most were those of Brittany, the Pas de Calais, and the Rhine.

The same returns show that the number of marriages have been steadily decreasing during the five years ending 1865; in 1861 they amounted to 305,203, in 1865 they had fallen to 298,838. The diminution was, however, less in 1865 than in either of the three previous years; in 1863 it amounted to nearly 2,200, while in 1865 it was 1,700.

Fine Arts.

EXHIBITION OF HISTORIC PORTRAITS IN PARIS.

A society of literary men, who hold conferences on the Boulevard des Capucines, have had the good idea of occupying their rooms during the off-season with a collection of portraits of notable persons of the time of the Revolution and of the Empire. The collection is not large, including only seventy-two works, and many of these of little artistic merit, but it is interesting.

There are four likenesses of Marie Antoinette; one a full-sized portrait from the collection of Madame Vigée Lebrun, executed before the revolutionary period, but the face is wanting in character though not in beauty. The other portraits of the unhappy queen are very unimportant; one is a common-place water-colour drawing of Marie Antoinette in a towering head-dress; the other a small oil painting of the same in a fancy costume. The queen also appears in a small group with Louis XVI. and other persons.

A small sketch in oil, not badly executed, represents Madame Elizabeth; the face is pretty, with a noble expression. The unfortunate Princesse de Lamballe is represented by a small portrait that bears little witness to the extraordinary beauty attributed to her.

Amongst the most interesting works are two full-sized half-lengths of the poor Dauphin, "L. 17;" one in oil, and the other in water colours. They are attributed one to Prudhon and the other to Madame Lebrun; at any rate they are characteristic pictures, and represent a beautiful, youthful face, one far more robust than the other, but the features and expression much the same in both.

The only portrait of the princes of the Royal Family is one of Monsieur, afterwards Louis XVIII., dressed in a character belonging to one of the historical ballets of Trianon; it is a common-place work.

Of the remarkable men of the revolutionary period, Robespierre is represented by two portraits; one being a mere sketch in oil on a piece of rough pannel, supposed to be from the pencil of David.

Marat is much better represented. One represents him as a young man in 1789; a poor work. Another, by Boze, bears date April, 1793, three months before he was assassinated. It is said to be the best portrait of him known; the face shows much power, but the characteristic is that of vulgar insolence. Lastly, there is a very small pen and ink sketch of the *Ami du peuple*, writing in a kind of cellar, and visited by a man with a pike in his hand and the republican cap on his head; a curious little work.

Saint-Just is represented in a life-sized portrait; the face remarkably handsome and young. He was executed at the age of 26. There are good portraits of Couthon and Danton, the latter by Greuze. A poor faded miniature of Camille Desmoulins; the only one known, and said to be by Boze. A good portrait of Hérault de Séchelles, who drew up the constitution of 1793, and fell with Danton at the age of 34; a well-painted portrait of Fabre d'Eglantine, the face splendid, also executed with Danton; a small, hard likeness of Collot d'Herbois; a good painting of Lebrun Vigée, artist, and husband of Madame Lebrun the painter, a young and beautiful face; a likeness of Marie Joseph Chénier, one of Rouget de Lisle, painted by Vincent, and pierced by a bayonet; Bailly, the Maire of Paris, is represented by two good works, one by Suvée, who painted the death of Coligny by order of Louis XVI., the head remarkably fine, the other, a pretty, small, oval medallion. Portraits of Tallien, of Hébert, by Jules Guérin, and De Calonne, the Louis XVI.'s last finance minister; a large head, well painted. A remarkable portrait of Fouché, evidently by a powerful hand, possibly David, but in a sad condition; the "intense ugliness" of the original is certainly fully expressed.

The women of the period are represented pretty fully. There are, amongst others, a portrait of Madame Roland, a rather girlish face; a very remarkable miniature of Charlotte Corday, the face very beautiful, yet exhibiting deep, though subdued sorrow, far less meretricious than the generality of the portraits extant. Ary Scheffer used this charming miniature for his picture of Charlotte Corday. A remarkably well-executed and characteristic portrait of La Reine des Halles, the market woman who headed the crowd that took possession of the Tuileries, was twice wounded, and slept that night on a gun carriage; a fine portrait of Anne Josèphe Théroigne de Méricourt, who performed the characters of Goddess of Reason, of Liberty, and of Beauty; the famous Jacobin flower girl; Mademoiselle Maillard, an opera singer, who was also a goddess of reason. There are other portraits of persons in the fancy costumes of the period, but they none of them reflect the accounts to be found in the narratives of the period; on the contrary, the dresses are in all cases modest, though showy.

The portrait of Olympe de Gouges, revolutionary writer and friend of Robespierre, who said, "Women have the right to mount the scaffold; they should also have the right to mount the tribune," is a striking figure of a masculine woman. One of the most lovely faces in the collection is that of Madame Tallien, admirably painted, and representing the Queen of the Directory in a man's dress and hat.

Of the Buonaparte family we have a pretty modern-looking water-colour drawing of Josephine previous to the empire; a good portrait of the Empress Marie Louise, the face handsome, but without sentiment; a poor one of Louis Buonaparte, King of Holland, perhaps by Gerard; and a large and fine work attributed to Prudhun, representing the little king of Rome at the knees of Madame de Montesquieu.

There are some interesting pictures amongst the smaller works, including a capital head of a Jacobin, a young Incroyable, and female figures in the curious costumes of the period.

Four remarkable pictures of an earlier period are added to the collection—a fine three-quarter length portrait of Molière, an admirable portrait of Descartes, a Voltaire, young and handsome, and a head of Jean Jacques Rousseau, also young and good-looking.

The managers of this small exhibition have set a good example; the admission is one franc, but each visitor receives a catalogue with annotations by two known writers.

Commerce.

The Indian Tea Trade.—The *Produce Markets Review* says:—"The exports of tea from India in the twelve months ending June 30th, amounted to 8,700,000 lbs., an increase of more than a million on 1866-7, and a total nearly three times as great as five years ago. Notwithstanding the difficulties of the cultivators, the trade thus keeps on increasing, and even the late low rates are understood to have paid on properly managed estates. We think that the present low prices are in reality the best thing that could have taken place for putting matters on a sound basis. While extravagant rates were given here, the hopes of cultivators were unduly excited, and an absurd rate of profit was looked upon as certain. Such high prices in the meantime limited the consumption here to a comparatively small class of tea fanciers, while at the present moderate rates Indian teas are a necessity to the grocer, as they must in future continue to be. Nothing could formerly be more uncertain than the Indian tea market, and it is true that the most extraordinary differences in valuation are still common. But the market is now too large to be raised or depressed by the freaks of individual buyers, and the demand must go on for a long time increasing in a greater ratio than the consumption. A little further reduction, and the natives of India, who are very fond of tea, but who cannot buy it because of its high price, would enter the market, and a very small consumption per head of 200,000,000 people, would tax the energy of tea growers for many years to come. With the introduction of railways and of European enterprise generally, the available wealth of India is increasing in a fabulous proportion, and the old hoarding habits of the natives must, although by very slow degrees, disappear. As the tonic contact of the European way of doing things will also cause them to use their brains more rapidly, some stimulant drink will be required. Wine and spirits are, broadly speaking, unknown to the natives, and as the vine can never be cultivated in any part of the plains, the home product of tea, which is already liked and appreciated, seems to us to be marked out as the Indian stimulant of the future. We thus look upon the position of the Assamese and Himalayan gardens as an eminently sound one."

The Wine Crop in France.—The *Salut Public* of Lyons says:—"The wine crop offers a splendid aspect almost everywhere, and is magnificent in Burgundy, the Maconnais, Revermont, and Lyons country. In the vineyards of Beaujolais, the vine stocks literally bend beneath the weight of the grapes, which at present have attained almost their full size, and have begun to redden for the last few days. The owners are in high spirits; and if slight showers and great heat should alternate, as hitherto, there are grounds for expecting a very superior yield in quantity and in quality, as compared with that of last year; and, besides, the vintage can be made a month earlier. We cannot deny, however, that the prolonged drought, and the extraordinary heat, have caused some damage in certain quarters. In sandy and gravelly soils, many of the grapes have been roasted by the sun. The vineyards of the Mount d'Or have particularly suffered in that respect, and rain is ardently longed for. In the South, the oidium, comparatively inoffensive in these districts, has caused serious loss."

Publications Issued.

Œuvres de Lavoisier.—The fourth volume of this important work, published under the direction of M. Dumas, for the Minister of Public Instruction, has just been presented to the Academy of Sciences. The following is the list of contents of the volume:—1. Reports made to the Academy of Sciences. 2. History of the transformation of the Academy, in the year 1785. 3. Documents relative to the suppression of the Academy. 4. Labours of Lavoisier as a member of the consultative committee of arts and manufactures. 5. Reports on public instruction. 6. Reports on the manufacture of assignats. 7. Memoir on the distillation of eaux de vie and of sea-water.

Notes.

Horticultural Exhibition at St. Petersburg.—The International Horticultural Exhibition, already announced to take place in the capital of the Russian empire during the coming year, is now definitely fixed for the period commencing with the 17th and terminating with the 31st of May. Dr. Regel is appointed secretary of the commission, and president of the united committees, and a long list of officials and eminent horticulturists show that the exhibition in question is intended to be extensive and important. It will be curious to note if the horticulturists of Western Europe will venture to send their products so far.

Depredations at the Museum of Brunswick—It is said that M. Blasius, the director of the Brunswick Museum, has discovered that an immense number of works of art have been stolen from that establishment;

the losses include ninety pictures, of which five are by Albert Durer, and others by Paul Veronese, Murillo, Van Dyck, and other great masters, nearly the whole collection of Rembrandt's etchings, and some by Albert Durer; besides these, the Roman coins missing amount in value to ten thousand thalers.

YACHT CLUB OF FRANCE.—The Emperor sent a magnificent silver gilt cup, in the style of the Renaissance, the work of the well-known goldsmith, M. Maurice Meyer, jun., of Paris, to the Yacht Club of France, for the international match which was to take place at Dieppe on the 20th of the present month of August.

THE ITALIAN NAVY.—The Italian navy at present consists of 69 ships of war, of which 16 are iron clads, 20 screw vessels, 25 paddle, and 8 sailing vessels. The transports are 35 in number, of which 13 are screw ships, 10 paddle steamers, and 2 sailing vessels. The ships of war carry 966 guns, and are manned by 19,277 men. The transports carry 44 guns, with a crew of 2,032 men. The tonnage of the war vessels is estimated at 138,080 metric tons, and are valued at 128,052,840 frs. (£5,122,144). The transports are valued at 13,238,420 frs. (£529,540), and measure 26,343 metric tons.

INTERNATIONAL TELEGRAPHIC CONVENTION.—The *Moniteur Universel* of Paris gives the following account of the proceedings of the International Telegraphic Conference:—With the exception of the Papal States, whose government agreed beforehand to accept the decisions of the congress, all the European states were represented, with the addition of British India and Persia. The business of the conference was to revise the convention which has been in force since May, 1865, and, after long discussion, many ameliorations, including diminution of the tariffs, have been introduced. India affords one of the most remarkable examples; on and after the commencement of the coming year the charge for a simple dispatch between London and Calcutta will be reduced from 120 to 71 francs, and by that time several new European lines will be opened between Europe and India. Another important point is the establishment of an International Telegraph Office for the collection and dissemination of statistical and other information for general guidance. The administration of this central office is confided to Switzerland.

Patents.

From Commissioners of Patents' Journal, August 21.

GRANTS OF PROVISIONAL PROTECTION.

Annealing pots and stands—2480—S. Gardner.
Blind furniture—2482—B. Hunt.
Boilers—2479—J. Arnold.
Boilers—2484—J. Standen.
Boot and shoe sewing machinery—2448—A. V. Newton.
Boots and shoes—2466—A. V. Newton.
Boots and shoes, cleaning—2456—H. Churchman.
Bricks, &c.—2443—R. Schomburg.
Bricks, &c., machinery for making—2450—C. G. Johnson.
Buttons, &c., fastening for—2425—A. Arnold.
Candlesticks—2459—L. Price.
Coals, unloading from railway waggons—2430—S. Plimsoll.
Dredging machines—2429—H. O. Robinson.
Drill rollers and seed sowers—2341—J. Brigham and R. Bickerton.
Driving shafts, friction clutches for—2449—F. W. Kitson and P. Chalas.
Dyeing textile materials—2441—H. A. Bonneville.
Fire-arms—2478—W. E. Newton.
Fire-arms and ordnance, breech-loading—2436—H. W. Garrett and G. Holcroft.
Fire-arms, breech-loading—2419—T. Hunt.
Fire-arms, breech-loading—2468—T. W. Stapleton.
Fire-places and furnaces—2469—H. Moule.
Fuel, artificial—2451—J. Hamilton.
Governors of steam engines—2485—A. V. Newton.
Guns, big—2359—W. F. M. Green
Harvesting machines—2444—B. J. B. Mills.
Hats, &c.—2462—H. F. Freutel and H. Zox.
Hydraulic apparatus—2318—M. T. Shaw and T. H. Head.
Hydraulic press boxes—2423—M. Samuelson.
India-rubber fabrics—2471—B. Hunt.
Iron and steel—2453—A. V. Newton.
Iron, cast—2417—J. Heaton.
Lace fabrics—2475—J. Litchfield.
Lifting machine, applicable as a fire-escape, &c.—1185—E. Beningfield.
Looms—2431—J. R. Croskey.
Looms—2455—W. Millard.
Looms—2460—W. Pearson, W. Spurr, and H. Bradbury.
Machinery, regulating the speed of—2476—W. E. Newton.
Mattresses and camp beds—2447—J. Frazer and W. Marr.
Mills for grinding wheat, &c.—2446—E. Evans.
Motive-power apparatus—2490—J. Hird.
Ores, treating—2439—W. Spence.
Organic substances, preservation of—2405—J. F. Lackersteen.
Paper holders—2467—W. M. Moore.
Paper or woven fabrics, folding—2401—W. T. Royle.
Pumps—2457—E. Edwards.
Railway breaks, &c.—2433—G. N. Shore.
Rheumatism, &c., instrument to be used in the treatment of—2410—R. E. Drinhaus.
Rollers, dandy, used in the manufacture of paper—2472—J. Whitehead.
Safes—1311—A. Fiddes and C. J. Curtis.
Safes and strong rooms—2469—C. J. Curtis and A. Fiddes.
Safety-lamps—2464—W. and E. M. Hann.
Safety-valves, &c.—2458—M. Benson.
Sails, reefing and furling—2437—C. Wilson.
Scarfs, &c., method of holding—2415—G. Harvey.
Scissors—2463—A. M. Clark.
Screws and screw drivers—2486—W. E. Newton.
Shields for protecting vessels, &c., against missiles of war—2483—J. Kirk and J. Batstone.
Ships, batteries, &c.—2407—B. Sharpe.
Ships' logs—2427—G. Wilson.
Ships' propellers—2454—N. D. Spartali.
Ships' yards, &c.—2442—A. L. Hoffmann.
Shops, &c., lighting by gas, &c., from the outside—2266—W. Berry.
Steel and iron—2461—J. Hargreaves.
Sugar, loaf, cutting up—2411—W. W. Symington.
Taps—2487—D. Nickols.
Walls, &c, decorating—1821—J. H. Johnson.
War machine, offensive and defensive—2435—S. R. Renaudin.
Washing machines—2474—H. Benjamin.
Water-closets—2481—J. Broadfoot.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Swimming apparatus—2530—F. Barnett.

PATENTS SEALED.

607. P. H. Hancock and J. P. French.
612. R. Nicholls.
615. R., J. J., and L. R. Bodmer.
621. E. T. Hughes.
622. E. Hutchinson.
623. E. Hutchinson.
624. G. W. R. Pigott.
629. J. McLeod.
638. R. Ramsey and J. Cooke.
642. T. Hill.
643. R. Laidlaw & J. Thomson.
645. W. E. Gedge.
650. W. E. Newton.
654. F. Dumas.
656. R. A. Hope.
657. T. Blocksage.
658. C. C. and W. T. Walker.
673. J. Livesey.
674. J. G. Stidder.
675. A. S. Stocker.
676. R. Howard.
678. J. Leacock.
679. J. Robinson.
680. J. Dunkerley.
683. J. F. Low.
702. L. B. Schmolle.
725. W. Whittle.
727. G. Anderson.
743. A. M. Clark.
774. J. Brinsmead.
789. S. Brown.
790. R. Leake and R. Platts.
793. C. E. Brooman.
803. P. Koch.
806. W. Hartley.
807. H. B. Barlow.
827. A. Bourdon.
871. W. Bellhouse, jun., and R. Ashworth.
892. W. E. Newton.
947. C. Mather.
990. W. E. Gedge.
1544. W. R. Lake.
1779. H. A. Bonneville.

From Commissioners of Patents' Journal, August 25.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2140. A. Watt.
2167. J. Newton.
2174. D. Davies.
2244. H. C. Ash.
2259. C. Horsley.
2348. S. Fox.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2102. W. Baines.
2109. W. D. Player.
2108. S. Elson.

Registered Designs.

4957—July 8—Reversible locket and case—C. Exon, Birmingham.
4958—July 11—A brace buckle or adjuster—W. Toison, Fazeley, Staffordshire.
4959—July 16—Clip or fastener for elastic and other bands—G. Twigg, Birmingham.
4960—July 25—Reflector for gas—Kinder and Kindsey, Cannon-street, E.C.
4961—July 31—Cover or case for handkerchief—J. N. Richardson and Son, Belfast.
4962—August 4—Chin rest or holder for violins—G. Jones, Wolverhampton.
4963—August 13—Improved yacht camoose—Black and Son, Gosport, Hants.
4964—August 26—Gas stove—W. Warcup, Bristol.